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# Evaluation of Tillage, Residue, and Fungicide on Disease Incidence in Continuous Corn Production Systems

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## Introduction

There have been several changes in hybrid corn production in Iowa in recent years. Foliar fungicide use and removal of corn stalks in continuous corn systems is becoming more common in farmer-adopted practices as the need for economical feedstuffs for cattle feed and ethanol production have increased. Furthermore, with higher corn prices, the number of acres of corn-on-corn have risen in the past few years. Many of the common foliar leaf spot pathogens survive in surface residues, therefore, these changes in production practices may affect the risk of disease and associated yield loss. The objectives of this project under continuous corn were: 1) to assess the effect of residue removal and foliar fungicide application on the incidence of disease, and 2) changes in yield.

## Materials and Methods

Six treatments were included in the study; no-till, no-till with 50 percent residue removed, chisel plow system, no-till fungicide applied at growth stage R-1 (silking), no-till with 50 percent residue removed and fungicide applied at R-1, and chisel plow with fungicide applied at R-1. The fungicide applied was Headline AMP® (10.5 oz/acre). There were four replicates of each treatment arranged in a randomized complete block design. Each plot was 8 rows wide (30-in. row spacing) by 100 ft long. Corn was planted April 25, 2012 and May 15, 2013 with a John Deere 7000 series 4-row planter calibrated to plant 34,000 seeds/acre of corn following corn. Fungicides were applied to the middle four rows with a 10 ft hand boom at 20 GPA at R1 on July 12, 2013 and July 31, 2013. Early season anthracnose disease ratings were collected at V-2 growth stage, 20 plants per treatment were examined and only those plants that exhibited foliar symptoms were recorded. Grey Leaf Spot (GLS), Common Rust (CR), and Eyespot (E) disease severity were evaluated prior to fungicide application above and below the ear leaf and 14 days after fungicide treatment. Severity was estimated as the percent area of leaf-tissue diseased on the ear leaf of five arbitrarily chosen in the center two rows of each plot. Immediately prior to harvest, the incidence of stalk rot was assessed on 10 plants/plot using the pinch method. All plots were harvested with a John Deere combine on September 9, 2012 and October 28, 2013.

## Results and Discussion

Both growing seasons were very dry. The total July rainfall in 2012 was zero and the July rainfall in 2013 was .49 in. With very little rainfall, the disease incidence in both years was low and less than 3 percent disease severity was observed for foliar diseases. No effect was observed on the incidence of early season anthracnose leaf blight. Similarly, there was no effect of treatment on late season foliar disease severity or stalk rot.

Yields based on treatments varied from 122 bushels/acre in 2012 to 219 bushels/acre in 2013. The highest yielding treatment in 2012 was the no-till with no fungicide applied at 138.3 ($P<0.19$; Figure 1). A noticeable yield difference was observed in 2013. Yields of the no-till treatments differed from those treatments where the residue was removed or where the plots were tilled.

With a wide variation in April and May weather conditions between 2012 and 2013, we observed differences in yield related to tillage. Little to no effect of treatments occurred for the incidence of anthracnose at the V-2 growth stage, or for late season foliar disease. This was unexpected because many corn pathogens survive in surface residue and thus the risk of disease is greater. The dry July and August weather conditions prevented diseases from developing. Stalk rot ratings were done in both years, however there were no differences in stalk rot severity between treatments. Incidence of stalk rot was greatest in the chisel plow system (24%) and lowest (12%) in the no-till with fungicide-applied treatment (Figure 2).

The effect of tillage, residue, and fungicide on disease incidence is likely to be different in years with average to above-average rainfall conditions.

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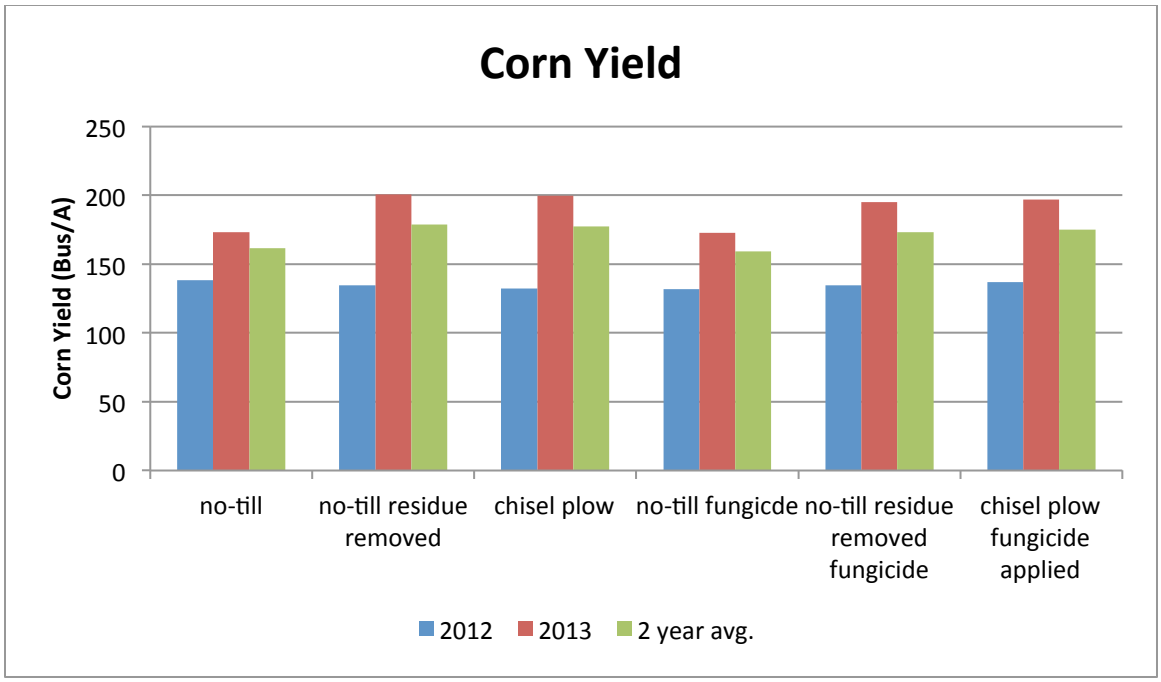


**Figure 1. Continuous corn grain yield as influenced by tillage and fungicide treatment.**

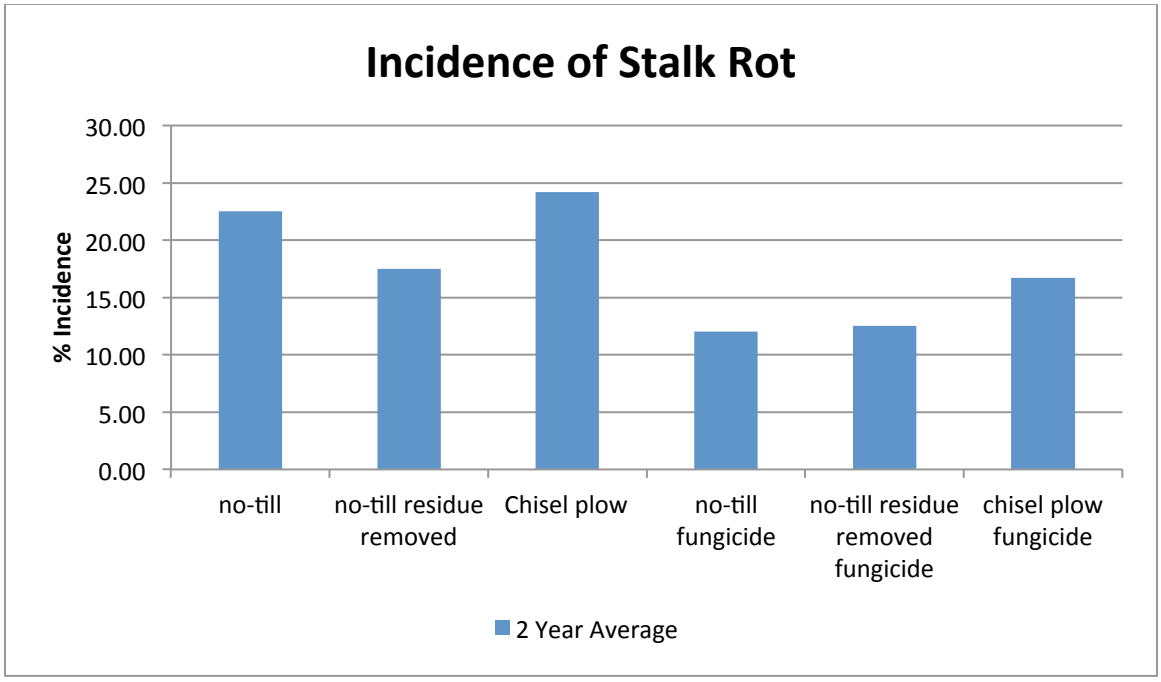


**Figure 2. Incidence of stalk rot in continuous corn observed prior to harvest utilizing the pinch test.**